

# Year 12 AS/A level Further Maths Baseline Test

## Instructions

- The time for the test is 1 hour.
- Answer **all** questions.

## Information

- The total mark for this paper is 48.
- The marks for each question are shown in brackets  
*-use this as a guide as to how much time to spend on each question.*

## Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

1 Simplify these expressions as far as possible.

**a**  $\frac{x^2 - 2x - 3}{x^2 + 2x + 1}$  (3 marks)

**b**  $\frac{x^2 - 25}{x^2 + 6x + 8} \div \frac{x^2 - 2x - 15}{x^2 - 16}$  (4 marks)

2 The line  $l$  is a tangent to the circle  $x^2 + y^2 = 20$  at the point  $P(2, 4)$ .

The tangent intersects the  $y$ -axis at point  $A$ . Find the area of the triangle  $OPA$ . (5 marks)

3 Expand and simplify  $(\sqrt{p} + 2\sqrt{q})(2\sqrt{p} - \sqrt{q})$  (3 marks)

4 **a** Write  $3x^2 - 12x + 7$  in the form  $a(x + b)^2 + c$  (3 marks)

**b** Hence, or otherwise, write down the coordinates of the turning point of the graph of  $y = 3x^2 - 12x + 7$  (1 mark)

5 Prove algebraically that the product of three consecutive **odd** numbers is always an odd number. (4 marks)

6 The functions  $g$  and  $f$  are defined as  $g(x) = \frac{2x}{4-x}$  and  $f(x) = 3x - 1$

Given that  $x \neq 4$ , find the value(s) of  $x$  such that  $g(x) = f(x)$ , giving your answer(s) to 2 decimal places. (6 marks)

7 The line  $l_1$  has equation  $y = -\frac{1}{2}x + 3$  and intersects the  $x$ - and  $y$ -axes at the points  $A$  and  $B$  respectively.

**a** Find the exact length of the line segment  $AB$ . (3 marks)

**b** Find the equation of the line  $l_2$  perpendicular to  $l_1$  which passes through the point  $P(-1, -2)$ . (2 marks)

The line  $l_2$  intersects  $l_1$  at the point  $C$ .

**c** Find the midpoint of the line segment  $AC$ . (4 marks)

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- 8** A triangle  $ABC$  has side lengths  $AB = 10$  cm,  $BC = 15$  cm and  $AC = 8$  cm.
- a** Find the size of the largest angle, giving your answer to 2 decimal places. **(3 marks)**
- b** Find the area of the triangle, giving your answer to 2 decimal places. **(2 marks)**
- 9 a** Sketch the graph of  $y = \cos x$  for  $-180 \leq x \leq 360^\circ$ , showing the points where the graph cuts the axes. **(2 marks)**
- b** Hence find the exact values of  $x$  in the interval  $-180 \leq x \leq 360^\circ$  for which
- $$\cos x = -\frac{\sqrt{3}}{2} \quad \textbf{(3 marks)}$$

**This is the end of the test.**